SYNOPSIS ON

STUDIES ON SOIL MYCOFLORA IN THE AGRICULTURE FIELD OF PULSES FROM PARBHANI REGION.

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STUDIES ON SOIL MYCOFLORA IN THE AGRICULTURE FIELD OF PULSES FROM PARBHANI REGION

INTRODUCTION

Soils are highly complex systems, with many components playing diverse functions mainly due to the activity of soil organisms (Chiang *et al*, 1994). Soil microflora plays a pivotal role in evaluation of soil conditions and in stimulating plant growth (Singh *et al*, 1999). Microorganisms are beneficial in increasing the soil fertility and plant growth as they are involved in several biochemical transformation and mineralization activities in soils. Type of cultivation and crop management practices found to have greater influence on the activity of soil microflora (Gill *et al*, 1980). Continuous use of chemical fertilizers over a long period may cause imbalance in soil microflora and there by indirectly affect biological properties of soil leading to soil degradation (Manickam *et al*, 1972).

Fungi are fundamental for soil ecosystem functioning (Mycol Soc *et al*, 1955). Especially in forest and agricultural soils, they play a key role in many essential processes such as organic matter decomposition and elemental release by mineralization (Christensen *et al*, 1989). Fungi are an important component of the soil micro biota (Ainsworth *et al*, 1995). Micro fungi play a focal role in nutrient cycling by regulating soil biological activity (Arunachalam *et al*, 1997).The quantities of organic and inorganic materials present in the soil have a direct effect on the fungal population of the soil. In addition to chemical fertilizers and wide range of pesticides shows adverse effect on mycoflora which are much useful to maintain soil fertility and eco-balance in the soil atmosphere. The aim of the present investigation is to isolate mycoflora from different crop fields, and to observe the percentage contribution of different fungal species.

The development of mycoflora is especially favoured by soils having an acidic reaction and where the aerobic condition is likely to be present near the surface.However the rate at which organic matter is decomposed by the fungi is interrelated to the chemical composition of the substrate as well as environmental conditions (Arunachalam *et al*, 1997). Fungi come in many different species, sizes, and shapes in soil. The numbers and kinds of microorganisms present in soil depend on many environmental factors: amount and type of nutrients available, available moisture, degree of aeration, pH, temperature etc.

Fungi are eukaryotic microorganisms that play important roles in terrestrial

ecosystems and can establish symbiotic relationships with plants. They can act as decomposers of animal and plant residues and thereby promote the carbon cycle in forest soils, provide mineral nutrients for plants, and alleviate the carbon limitation of other soil organisms; thus, they play crucial ecological roles. They play a major role in fertility and promoting plant health.As in similar studies of plants, animals and soil bacteria, some recent studies of soil fungi have focused on altitudinal distribution patterns; however, these studies are often performed in low- and mid- latitude regions.

Fungi are ubiquitous and important because of their presence in all climates and on all substrate. They can be easily cultured though some require special media to grow but the biotrophs fail to grow in axenic cultures. For proper growth and sporulation of a fungus specific requirements (nutrients, temperature, moisture, light, relative humidity etc.) of a fungus are to be fulfilled. Fungi produce different enzymes,can degrade different plant materials,and can colonise different environmental niches. The degradation of all organic and agricultural substances depends on the presence or the absence of enzymes secreated by the microorganisms. Some fungi produce toxic secondary metabolite known as mycotoxin. Mycotoxins are characterized as odourless and testeless compounds,thus their identification in food is difficult.

Diversity is not evenly distributed rather it varies greatly across the globe as well as within regions. Seasonal variations affect the distribution of fungi of particular area. Number and types of fungal species change with the season, geographical location and the presence of local spore sources.. Diversity and distribution of soil fungi have been studied by several mycobiologist in india. fungi grow on diverse habitats in nature and are cosmopolitan in distribute ion requiring several specific elements for growth and reproduction. In laboratory, these are isolated on specific culture medium for cultivation, preservation, microscopical examinations and biochemical and physiological characterization. The species richness of a fungal community and relative abundance of individual species have been considered as measures of functional activities of the group in the particular habitat (Kjoller *et al*, 1982).

Fungi, bacteria and actinomycetes colonize different habitats and substrates and play substantial role in plant health and productivity besides producing diseases. The role of fungi in the soil is an extremely complex one and is fundamental to the soil ecosystem.

Survey of Literature:

Pandey *et al* (2014) seasonal variations in soil fungal population of traditional sugarcane field 50 different species belonging to Phycomycetes and Deuteromycetes were isolated.

Madhan raj *et al* (2010) reported that 45 soil samples were collected from 8 different station along the entire Tamilnadu coast and examined by dilution plating method to access the fungal diversity and their population density.

Ratna Kumar *et al* (2019) studied Soil Mycoflora in different soil samples in crop fields of Chintalapudi Mandal in West Godavari District, Andhra Pradesh, India.

Jadhav *et al* (2017) they have isolated 18 species belongs to 4 genera from Kadegaon Tehsil, Sangli District, Maharashtra, India.The Aspergillus genera were dominant.

Gnanasekaran *et al* (2015) about sixty five fungal species representing 26 genera were isolated and identified of Soil Mycoflora in Banana Field at Manachanallur, Tiruchirappalli District., Tamil Nadu and found Aspergillus, Penicillium and Trichoderma species were dominant in their study.

Chandrashekar *et a*l (2014), isolated and identified Fungal diversity in rhizospheric soils from paddy, pulses, ragi, sugarcane, vegetables and banana fields of Nanjangud taluk of Mysore district, Karnataka, and recorded 10 fungal species representing 7 genera. They have reported Aspergillus, Alternaria, Mucor, Curvularia, Fusarium, Penicillium and Rhizopus. We have isolated 27 species belongs to 19 genera in that Aspergillus and Fusarium and Alternaria were dominant.

Shiny *et al* (2013), Investigated Mycoflora of total of 12 species belongs to 6 genera from Soil in Different Crop Fields at Narasannapeta Mandal, Srikakulam District. Aspergillus and Penicillium were dominant in their study.

Gap in the research:

Many scientists worked on Soil mycoflora in Marathwada such as Saxena et al

(1955), Gangawane and Deshpande (1972), Rama Rao (1973). Pandey (2014),they worked on diversity of Soil fungi in different crop field. But work regarding to seasonal variation of soil mycoflora in the agriculture field of pulses till not explored much in Parbhani region.

Statement of the problem:

In Marathwada very few selected places were visited for diversity point of view. All left areas may harbourmany more fungal species which need further detailed investigations (Gavhane *et al,* 2015). Soil fungi have essential roles in ecosystem, but the seasonal dynamics of soil mycoflora of pulses field remain unclear. To explore the pattern and variation of soil fungal community diversity across the seasons, identify the main contributors to soil fungal communities.

Scope of Research work:

Present work focuses on studies on soil mycoflora and seasonal variation in soil mycoflora of pulses field from Parbhani region. There is lot of scope in future to explore the diversity of soil mycoflora from unexplored area and show the seasonal variations in species richness.

Relevance of Research work:

Variation of soil fungi research focused on isolation and identification of soil mycoflora of natural origin. The fungal population is not homogeneous throughout the year and show seasonal variation. During present investigation period fungal population was vary from season to season. Soil fungi having industrial, pharmaceutical applications similar to plants. They need antibacterial, antiviral, antioxidant, antifungal etc. compounds to survive in their natural environment and soil fungi have a great potential for the production of enzymes. Extracellular enzymes produced by soil decaying fungi can be used as an important factor for the conversion of organic debris into humus and helps in production of valuable, useful product. soil mycoflora are involved in the biodegradation of pollutants including xenobiotics.

Significance of the work:

This work is significant as it helps to know diversity and seasonal variation of soil mycoflora of pulses field in Parbhani region. Soil fungi is an immense source of extracellular biodegradating enzymes. This work also helps to new species discovery.

Seasonal variation affects the diversity of soil inhabiting fungi underpins many crucial ecosystem services which support the plants and animals typically targeted by conservation efforts.

Objective of the research:

1. Analysis of Physico-chemical characters of the soil samples collected from Parbhani region.
2. Isolation and Identification of Soil fungi.
3. Detection of fungal diversity in the agriculture soil samples present in the pulses crop fields of Parbhani region in different location and season.
4. Studies on Physical & Nutrional factors for growth of fungi on different nutrient medium.
5. Studies on mycotoxin bioassay.
6. To check the potential for production of various enzyme by isolated fungi.
7. To enhance sufficient knowledge to the farmers for the conservation of soil properties, management of soil microbial diversity and the development of sustainable agro system.

Hypothesis:

Soil fungi have essential roles in ecosystem including regulate soil nutrient cycling, improve nutrient aquisition for plant and affect plant biomass and plant productivity. Seasonality also influences soil fungal community in ecosystem.

MATERIALS AND METHODS:

A.Collection of samples:

Soil samples will be collect at different seasons from different localities of Parbhani region, for the analysis of mycoflora. The soil samples will be collected from different pulses fields (upto10-15cm depth) in sterile polythene zip locked bags. All samples will be kept in the laboratory for analysis in the fridge until needed.

B.Isolation of soil fungi:

The isolation of fungi will be done using of soil dilution method Waksman, (1927). Soil samples will be collected from different places of the irrigated and non irrigated pulses field at 5 -15 cm depth from each field, 200g soil samples will be collected and pooled together to obtain composite sample. The soil samples will be collected in sterile polythene bags cleaned with alcohol and labeled after collection. The samples will be kept it in the

laboratory for further analysis. The fungal species will be isolated by serial dilution by Soil Dilution plate, Waksman (1922) and Soil plate method,(Warcup 1950) on different media such as Glucose Nitrate agar ,Czapek-Dox agar and Potato Dextrose agar media. 1 gm of each soil sample is added in each 10 ml of distilled water respectively. Up to 10-4 serial dilution will be carried out. By using sterile spreader, 0.1 ml sample will be spread on the petri-plate containing Glucose Nitrate agar,Czapek-Dox agar and Potato Dextrose agar medium, One percent streptomycin solution was added to the medium before pouring into petri-plates for preventing bacterial growth only for the isolation of fungi. The Petri dishes will be then incubated at 28 ± 2°C in room temperature petri-plates will be kept in the room temperature and observed after 7 days.

C.Identification of fungi:

The isolation of fungal pure culture will be done with PDA medium in the standard petriplates by single spore culture technique. By considering some parameters like colony colours and their appearance, growth pattern, sporulation, etc. identification of fungi will be done. Microscopic study will be also done. Characters observed like types of hyphae their branching pattern, presence and absence of septa, types of spores, sporangiophore will be observed during the study. All microscopic study will be done with help of books and manual and most updated keysviz. Raper and Thom (1949), Raper et al., (1965), Nagamani A, Kumar IK and Manoharachary C. (2006), Eills (1976), Mukadam (2006) and Barnett and Hunter, (1998).

D.Data analysis:

Data analysis will be done used to assess the relationship between the physico-chemical parameters and total fungal colonies.

Expected outcome:

The expected outcome of this work includes first information about fungal communities under different pulses crop fields and in different seasons for three consecutive years. Identification of soil mycoflora in this region brings awareness about their presence and diversity. Many fungi from this region still remain unreported and their seasonal variations are unknown to us. If discovered, some of them may serve as the seasonal variation in species richness and number of colonies.

Plan of work

First year

- Review of Literature, collection, study of references and methodology books.

- Physio-chemical analysis of soil.
- Collection and Identification of specimens of soil mycoflora.
- Isolation and pure culture of collected soil mycoflora.

Second year

- Assessment and compare the composition, species richness and diversity of mycoflora occurring in soil
- *In vitro* studies on physical and nutritional factors for growth of fungi on different medium.
- Studies of seasonal variation of soil fungi and pointed out seasonal changes in soil mycoflora.
- production of various enzymes from soil fungi.

Third year

- Characterization of soil mycoflora.
- Data analysis.
- Writing and submission.

This work will be carried out in following parts:

Part-1: This part will deal with detailed information about collection, identification and diversity of soil mycoflora.

Part-2: This part will deal with Isolation of soil mycoflora for seasonal variation and detection of fungal diversity.

Part-3: This part will deal with the physical and nutritional factors for growth of fungi and production of mycotoxin by soil fungi.

Part-4: This part will deal with the production of various enzymes from soil fungi and to provide sufficient knowledge to the farmers for the conservation soil properties.

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